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The Scutacarid Mites of Japan

VII. Revised Definition of the Genera *Archidispus* and *Imparipes*, with Descriptions of Five New *Archidispus*

With 18 Text-figures

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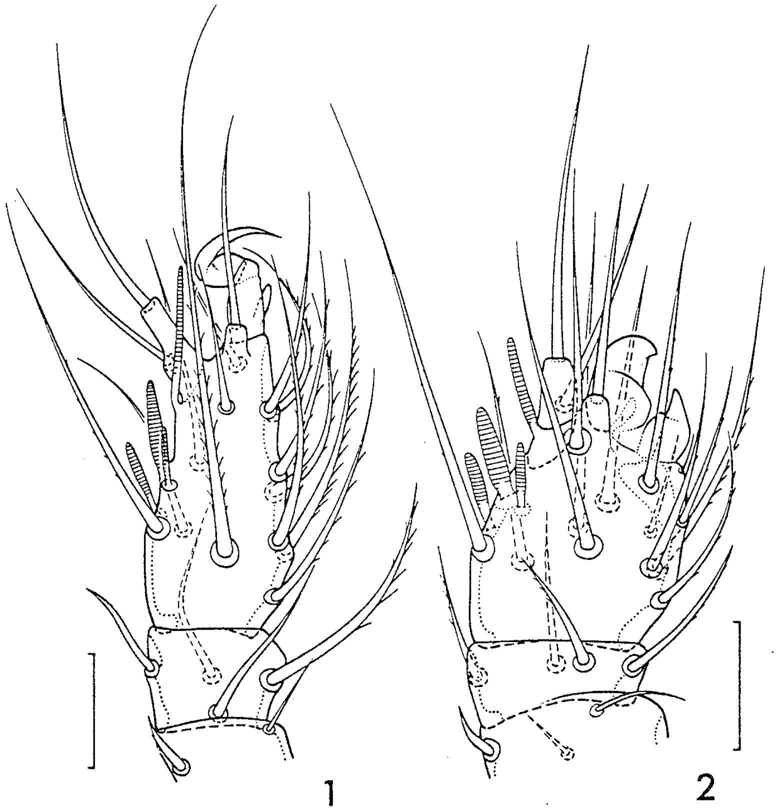
ABSTRACT The definition of the genera *Archidispus* KARAFIAT, 1959, and *Imparipes* BERLESE, 1903, of the family Scutacaridae is revised mainly on the basis of the structure of claw I and its associated apparatus in the female. The conformation of the female leg IV currently used as discriminating characters between *Archidispus* and *Imparipes* is considered often unreliable and treated only complementally. *Imparipes* (*Imparipes*) *intermissus* KARAFIAT, 1959, and *Imparipes* (*Archidispus*) *haarloevi* KARAFIAT, 1959, are transferred to the genus *Archidispus* and the genus *Imparipes* in a strict sense, respectively. Five new species of *Archidispus* related to *A. intermissus* are described from Japan under the names of *A. subintermissus*, *A. jezoensis*, *A. satoui*, *A. okumurai* and *A. difficilis*. They are only known from adult females and found attached to the membrane between head and prothorax or that between pro- and mesothorax of ground beetles. Definition of the group of *A. intermissus* and a key to its component species are presented.

Archidispus was originally erected by KARAFIAT (1959) as a subgenus of *Imparipes* BERLESE, 1903, on the basis of the peculiarities of tarsus IV in the female, *viz.* the marked prolongation of its proximal and distal portions. RACK (1973) raised it to the generic rank, and MAHUNKA (1974) and KUROSA (1976) followed her. However, DELFINADO and BAKER (1976) still regarded it as a subgenus of *Imparipes*.

Examining various species of *Imparipes* (sensu KARAFIAT, 1959), I have found that the elongation of the proximal portion of tarsus IV is a character not always reliable in discriminating *Archidispus* from *Imparipes* and that the conformation of the claw and its associated apparatus of leg I is much more important for classifying them. A revised definition of the two genera will be given below.

Genus Archidispus *KARAFIAT, 1959*

Female. Tibiotarsus of leg I (Fig. 2) more or less stout, distally with a strong

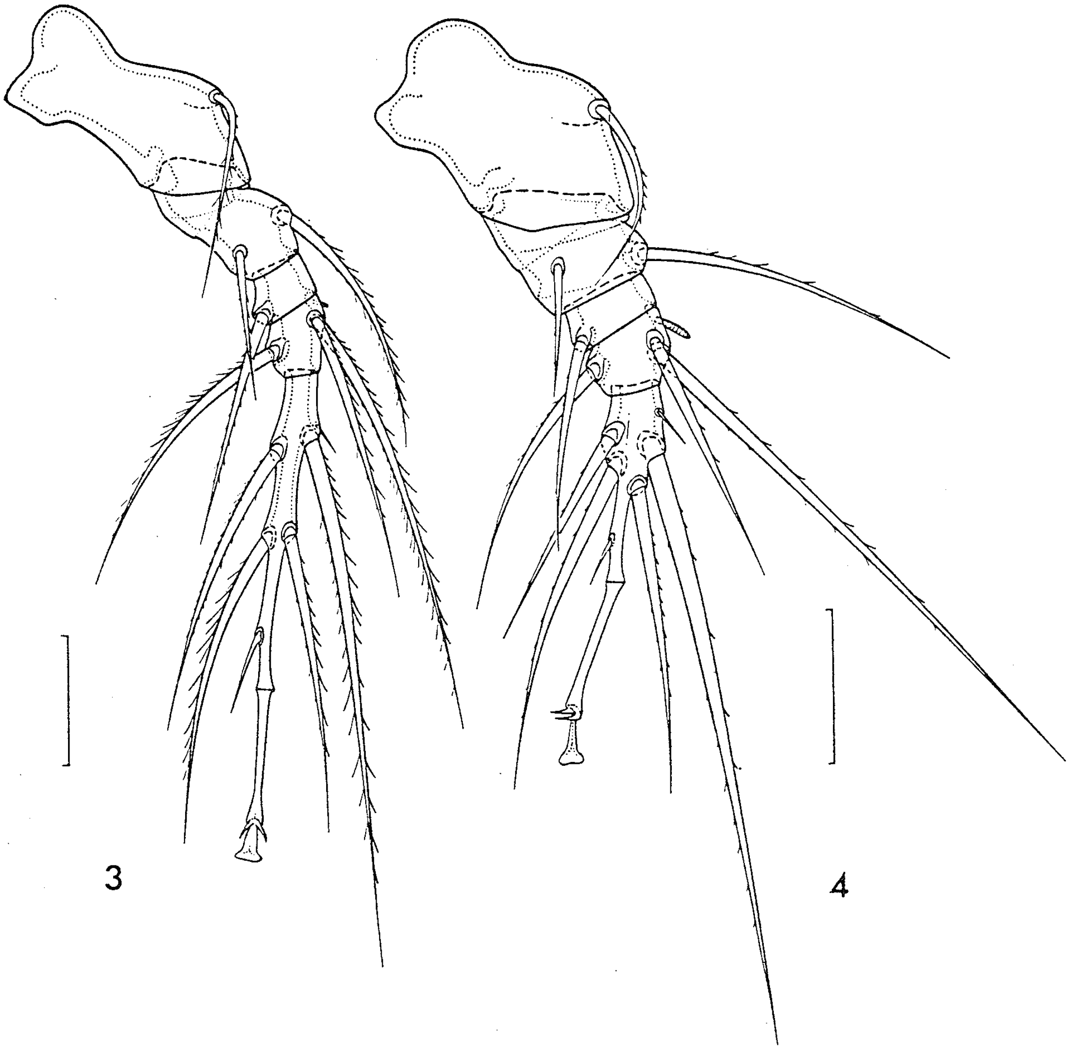


Figs. 1–2. Leg I (trochanter and proximal portion of femur are omitted); dorsal view. —— 1. *Imparipes* (*Imparipes*) sp. from Japan, female. —— 2. *Archidispus subintermissus* sp. nov., female. Scales: 15 μm.

sessil claw and an opposable notched "thumb" for the reception of the former. Tarsus IV usually with elongated proximal and distal portions. In some species, the proximal portion of tarsus IV (Fig. 4) is rather shortened and widened, but intermediate forms also occur. One or more pairs of setae on hysterosomal tergites and/or coxisternal plates either distinctly thickened at base or otherwise modified in most cases.

Genus Imparipes *Berlese, 1903*

Female. Tibiotarsus of leg I (Fig. 1) generally not very stout. Claw of leg I well developed to very small, sometimes absent; when present it is always distinctly pedicellate, with apex attenuate and often recurvate; inner margin of pedicell basally with a bluntly pointed or round-tipped, sclerotized process which is directed obliquely distad. In some species having a greatly reduced claw on tibiotarsus I, the process may be lacking or at least indiscernible. Tarsus IV usually more or less shortened at the proximal portion, but may be much elongated at the proximal and distal portions (Fig. 3) in the species without a claw on tibiotarsus I.



Figs. 3–4. Leg IV; ventral view. —— 3. *Imparipes* (*Imparipes*) sp. near *haarloeyi* KARAFIAT, 1959), from Japan, female. —— 4. *Archidispus subintermissus* sp. nov., female. Scales: 25 μm.

In the subgenus *Telodispus*, the distal portion of tarsus IV is greatly reduced and its ambulacrum is lacking. Setae on hysterosomal tergites and coxisternal plates usually simple except for *2b*.

The members of the genus *Archidispus* seem to be mainly associated with beetles of the families Carabidae, Staphylinidae and Scarabaeidae. On the other hand, *Imparipes* includes many species found in association with ants, termites and halictid bees, no species of the genus having been known so far to be beetle associates.

About 180 species of scutacarid mites have been described from the world as the members of the genera *Archidispus* and *Imparipes*, but not a few of them seem to have been placed in wrong genus, probably because a clear distinction between the two genera has not yet been established. For example, *Imparipes* (*Imparipes*) *intermissus* KARAFIAT, 1959,[1] from Europe is, judging from the original description and illustrations, considered to belong to the genus *Archidispus*. *Imparipes* (*Archidispus*) *haarloevi* KARAFIAT, 1959, treated by RACK (1973) and MAHUNKA (1981) as a member of the independent genus *Archidispus*, should be transferred to the genus *Imparipes* in a strict sense. In short, it seems necessary to make re-examination of all the problematical species described till now under *Archidispus* or *Imparipes*.

In the course of my study on scutacarid mites associated with Japanese ground beetles, I found some species of *Archidispus* similar in the conformation of leg IV to *A. intermissus*. They are all new to science and will be described in the present paper. The holotypes of the new species are to be deposited in the collection of the National Science Museum (Nat. Hist.), Tokyo.

Comment on terminology and illustration.

The terminology used in this paper follows mainly that of VAN DER HAMMEN (1970) with slight modification, except for the following: 1) the dorsal setae of hysterosoma are designated according to LINDQUIST's system (1977), and 2) the leg seta (excluding solenidia) are named after KARAFIAT (1959). As in my previous papers on Scutacaridae and Pygmephoridae, all the setae in the illustrations of body and leg IV except those on gnathosoma, *1b* on anterior coxisternal plate and *a* on trochanter IV, are drawn in the horizontally appressed state so as to show their accurate length.

Archidispus subintermissus sp. nov.

(Figs. 2, 4–6)

Archidispus sp. No. 23: KUROSA, 1977, 397, fig. VII-D.

Female. Length of body (length of idiosoma), 177–220 μm; width of body (width of first hysterosomal tergite), 144–188 μm; mutual distance of anterior coxal condyles of leg III, 68–83 μm (mean 79.16 ±S.D. 2.79 μm, N=80).

Closely related to *Archidispus intermissus* (KARAFIAT, 1959), comb. nov., but readily distinguished from it by the position of hysterosomal dorsal setae f and h_1.

Dorsum. Free margin of first hysterosomal tergite with distinct radial striations. Dorsal setae of hysterosoma rather slender, with fine and sparse barbations; c_1 and c_2 fine, situated nearly on the same level, not very different in length; marginal thickening of insertion pore for c_2 without mesal or posteromesal protrusion; d, f and h_1 much longer than e and h_2, situated comparatively close to lateral margin of each tergite; h_1 usually slightly shorter than f; ratio of distance $d\text{-}d/h_2\text{-}h_2$ 1.03–1.09; $f\text{-}f/e\text{-}e$ 0.65–0.72; $h_1\text{-}h_1/h_2\text{-}h_2$ 0.53–0.62. The order in length of dorsal

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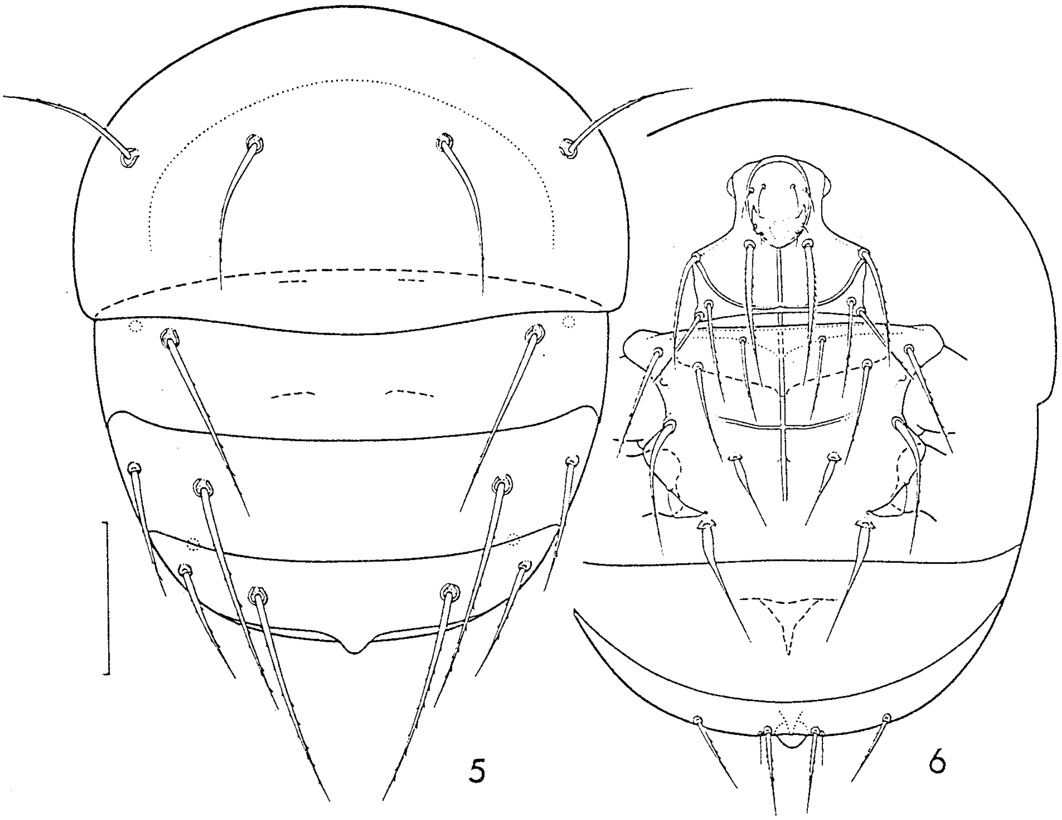
[1] In his original description, KARAFIAT noted as follows: "Auf *Lasius fuliginosus*. Selten (1 Exemplar)." This is the only record probably indicating a close association of an *Archidispus* with ants.



Figs. 5–6. *Archidispus subintermissus* sp. nov., female. —— 5. Dorsum. 6. Venter. Scale: 50 μm.

setae of hysterosoma: $f \geqq h_1 \geqq d > c_1 \geqq c_2 > h_2 \fallingdotseq e$.

Venter. Apodeme II somewhat variable in shape, its median 1/3 being sometimes evenly arcuate, sometimes straight, sometimes weakly curved backwards, and sometimes forming a shallow re-entrant angle medially. Secondary transverse apodeme weakly curved backwards, medially touching apodeme II or nearly so. Apodeme IV somewhat oblique, extending about 1/2–3/5 way to ventral margins of coxal foramina III. Coxal setae: *1a* nearly on a level with the posteriormost point of gnathosomal foramen, close to apodeme I, comparatively long and stout, with rather conspicuous barbations; *2a* anteromesad of *2b*; *3b* a little more spaced than *2a* (ratio of distance *3b–3b*/*2a–2a* 1.19–1.21), sometimes slightly thickened at base; *4a* and *4b* glabrous; *4a* situated closer to apodeme IV than to the level of *4b*, distinctly thickened and nearly straight (sometimes slightly incurved) in proximal 2/5 or thereabouts, but fine distally, the transition from thick to thin portions being not very abrupt; *4b* conspicuously thickened and obviously incurved at the proximal portion, gradually tapering towards fine tip; *4c* also thickened and incurved proximally, gradually tapering towards fine tip. Caudal setae ps_1 and ps_3 relatively short and thin, with weak barbs; ps_1 a little longer than ps_3; ps_2 short, less than half the length of ps_1.

Legs. Leg I (Fig. 2): tibiotarsus stout. Legs II and III: anterior claw larger than posterior one. Leg IV (Fig. 4): proximal portion of tarsus fairly short and wide; distal portion of tarsus, and pretarsus moderately elongate; pretarsus about 2/3–3/4 as long as tarsus; setae *c* and *l* with fine apex as other long setae; *c* considerably long, nearly as long as combined length of tarsus and pretarsus; *l* very long, not less than twice the length of *k*; *p* nearly as long as *l*; *q* small, usually at some distance from *p*.

Bionomics. The specimens examined (about 400 in total), all females, were collected from adults of ground beetles belonging to 12 genera. They are as listed below:

Tribe Carabini — *Carabus* (*Asthenocarabus*) *opaculus opaculus* PUTZEYS; tribe Broscini — *Craspedonotus tibialis* SCHAUM; tribe Pterostichini — *Trigonotoma lewisi* BATES, *Poecilus* (*Poecilus*) *fortipes* CHAUDOIR, *Pterostichus* (*Argutor*) *longinquus* BATES, *P.* (*Bothriopterus*) *subovatus* MOTSCHULSKY, *P.* (*Eurythoracana*) *haptoderoides japanensis* (LUTSHNIK), *P.* (*Rhagadus*) *microcephalus* (MOTSCHULSKY), *P.* (*Platysma*) *fortis* MORAWITZ; tribe Agonini — *Synuchus* (*Synuchus*) *arcuaticollis* (MOTSCHULSKY); tribe Amarini — *Amara* (*Amara*) *chalcites* DEJEAN, *A.* (*Celia*) *nipponica* HABU, *A.* (*Bradytus*) *simplicidens* MORAWITZ, *A.* (*B.*) *macros* (BATES), *A.* (*Curtonotus*) *macronota* (SOLSKY), *A.* (*C.*) *gigantea* (MOTSCHULSKY); tribe Harpalini — *Anisodactylus* (*Anisodactylus*) *signatus* (PANZER), *A.* (*A.*) *punctatipennis* MORAWITZ, *Harpalus* (*Pseudoophonus*) *vicarius* HAROLD, *H.* (*P.*) *griseus* (PANZER), *H.* (*P.*) *eous* TSCHITSCHÉRINE, *H.* (*P.*) *tridens* MORAWITZ, *H.* (*P.*) *sinicus sinicus* HOPE, *H.* (*P.*) *niigatanus* SCHAUBERGER, *H.* (*P.*) *simplicidens* SCHAUBERGER, *H.* (*Pardileus*) *calceatus* (DUFTSCHMID), *H.* (*Acardystus*) *platynotus* BATES, *H.* (*Harpalus*) *corporosus* (MOTSCHULSKY), *H.* (*H.*) *bungii* CHAUDOIR, *H.* (*H.*) *tinctulus* BATES, *Trichotichnus* (*Trichotichnus*) *congruus* (MOTSCHUSLKY), *T.* (*T.*) *vespertinus* HABU, *T.* (*T.*) *longitarsis* MORAWITZ, *Stenolophus* (*Egadroma*) *quinquepustulatus* (WIEDEMANN), *S.* (*E.*) *smaragdulus* (FABRICIUS), *Anoplogenius cyanescens* (HOPE).

The female mites were found invariably clinging to the cervical membrane between head and prothorax of 'host' insects, with the exception of 11 specimens from the intersegmental membrane between pro- and mesothorax of *S. arcuaticollis*, *H. bungii*, *T. vespertinus* and *A. cyanescens*. The largest number of the mites per host was 54 (on *A. simplicidens*). Nothing is known of the male and immature stages.

Among the Japanese representatives of the genus *Archidispus*, the present new species is probably one of the most comprehensive in its host preference.

Type-series. Holotype: ♀, Riv. Tonegawa by Toride-shi, Ibaraki Pref., 17–IX–1972, K. KUROSA, ex *H. platynotus*. Paratypes: 3 ♀, same data as the holotype; 8 ♀, same data as the holotype but ex *P. h. japanensis*, *H. corporosus*, *T. longitarsis* & *A. cyanescens*; 18 ♀, Tokyo University Forest in Furano, Hokkaido, 17– & 19–IX–1967, K. SUGIYAMA, ex. *C. o. opaculus*, *P. subovatus*, *A. macros* & *T. longitarsis*; 21 ♀, Tajima-ga-hara by Riv. Arakawa, Urawa, Saitama Pref., 1–IX–1971 &

18–VIII–1972, K. KUROSA, ex *P. h. japanensis*, *A. gigantea*, *A. signatus*, *A. punctatipennis*, *H. eous*, *H. s. sinicus*, *H. niigatanus*, *H. simplicidens* & *H. bungii*; 5 ♀, Angyô, Kawaguchi, Saitama Pref., 15–X–1970, K. KUROSA, ex. *H. tridens*; 7 ♀, Wakô-shi, Saitama Pref., 18–VI–1968, K. KUROSA, ex *A. chalcites*; 5 ♀, Narimasu, Itabashi-ku, Tokyo, 24–VI–1958, 11–IX–1958 & 28–IX–1958, K. KUROSA, ex *A. nipponica* & *A. gigantea*; 4 ♀, Doshida-chô, Nerima-ku, Tokyo, 14–IX–1975, K. KUROSA, ex *H. bungii*; 4 ♀, Torami, Chiba Pref., 25–VIII–1976, K. KUROSA, ex *H. bungii*; 2 ♀, Inada by Riv. Tamagawa, Kawasaki, Kanagawa Pref., 23–VII–1958, K. TANAKA, ex *A. macronota*; 2 ♀, Tsunashima by Riv. Tsurumigawa, Yokohama, 6–X–1967, T. OKUMURA, ex *A. gigantea*; 1 ♀, Riv. Sagamigawa by Atsugi, Kanagawa Pref., 10–V–1972, K. KUROSA, ex *A. nipponica*; 6 ♀, Hiratsuka, Kanagawa Pref., 24–VII–1958, 27–VIII–1958 & 14–VIII–1959, K. TANAKA, ex *A. macronota* & *A. gigantea*; 5 ♀, Mt. Ômuro-yama, Shizuoka Pref., 11–IX–1966, K. OGURA, ex *T. vespertinus* & *T. congruus*; 2 ♀, Mori-Miyanohara, Nagano Pref., 5–IX–1975, Y. KUROSA, ex. *H. tridens*; 1 ♀, Sugadaira, Nagano Pref., 12–IX–1939, T. S. OKADA, ex *P. fortipes*; 3 ♀, Riv. Yodogawa by Moriguchi, Osaka Pref., 30–VI–1940, Y. YANO, ex *A. simplicidens*; 1 ♀, Motoyama-chô, Higashi-Nada-ku, Kobe-shi, 4–IX–1941, K. SAKAGUTI, ex *H. niigatanus*; 1 ♀, near Ichinomiya, Tokushima-shi, 21–IX–1982, Y. KUROSA, ex *C. tibialis*; 1 ♀, Kamiyama-chô, Tokushima Pref., 21–IX–1982, Y. KUROSA, ex *H. s. sinicus*; 1 ♀, Ochi-chô, Kôchi Pref., 16–IX–1982, Y. KUROSA, ex *H. tridens*; 1 ♀, Mt. Hiko-san, Fukuoka Pref., 7–VIII–1962, H. KAWAI, ex *H. niigatanus*; 1 ♀, Yoshii-machi, Fukuoka Pref., 12–VI–1957, N. GYÔTOKU, ex *P. longinquus*; 3 ♀, Saeki, Ôita Pref., 8–IX–1971, K. KUROSA, ex *A. signatus* & *H. s. sinicus*; 4 ♀, Maesato, Ishigaki Is., Okinawa Pref., 14–X–1975, T. TAKAHASHI, ex *H. s. sinicus*; 1 ♀, Ôtomi, Iriomote Is., Okinawa Pref., 28–IV–1979, Y. KUROSA, ex *S. smaragdulus*.

Further specimens examined. Besides about 150 specimens with the same data as the type-series, the followings were examined: — 9 ♀, same data as the holotype but ex *P. fortis*; 1 ♀, Izumisawa near Hakodate, Hokkaido, VIII–1941, Y. YANO, ex *H. vicarius*; 2 ♀, Kashima-shi, Ibaraki Pref., 19–VIII–1967, K. KUROSA, ex *A. signatus*; 1 ♀, Yokokawa, Gunma Pref., 14–VIII–1967, K. KUROSA, ex *H. griseus*; 18 ♀, Mt. Hodo-san, Nagatoro, Saitama Pref., 4–IX–1974, Y. KUROSA, ex *H. vicarius*; 6 ♀, Wakô-shi, 18–VI–1968 & 22–VIII–1976, K. KUROSA, ex *H. calceatus* & *A. cyanescens*; 7 ♀, Narimasu, Tokyo, 24–VI–1958, K. KUROSA, ex *S. quinquepustulatus*; 24 ♀, Higashi-Kanamachi by Riv. Edogawa, Katsushika-ku, Tokyo, 7–I–1968, T. OKUMURA, ex *P. microcephalus*; 3 ♀, Kita-Kogane, Matsudo, Chiba Pref., 1–XII–1968, T. OKUMURA, ex *A. cyanescens*; 5 ♀, Zengyô, Fujisawa, Kanagawa Pref., 1–X–1967, K. SUGIYAMA, ex *P. h. japanensis*; 1 ♀, Kannami, Shizuoka Pref., 13–II–1972, T. OKUMURA, ex *T. lewisi*; 5 ♀, Riv. Yodogawa, Osaka Pref., 28–IX–1958, K. UEDA, ex *P. h. japanensis*; 23 ♀, Riv. Yodogawa by Moriguchi, 30–VI–1940, Y. YANO, ex *P. microcephalus* & *H. tinctulus*; 4 ♀, Rinnanji, Higashi-Sumiyoshi-ku, Osaka-shi, 27–IX–1940, Y. YANO, ex *P. microcephalus*; 1 ♀, Sonoda, Amagasaki, Hyôgo Pref., 2–IX–1948, M. YOSHIDA, ex *H. s. sinicus*; 3 ♀, Sowayama, Nada-ku, Kobe-shi, 5–XI–1939, K. KUROSA, ex *S. arcuaticollis*; 9 ♀, Mt. Daimanji-yama, Oki-Tôgo Is., Shimane Pref., 30–XII–1968, T. OKUMURA, ex *A. punctatipennis*; 11 ♀, Tarumi, Matsuyama, Ehime Pref., 28–VI–1948, M. MIYATAKE, ex *H. s. sincus* & *A. cyanescens*; 9 ♀, Hagitayama, Kumamoto-shi, 5–I–1969, T. OKUMURA, ex *A. punctatipennis*.

Distribution. Japan (Hokkaido, Honshu, Shikoku, Kyushu, Ryukyus).

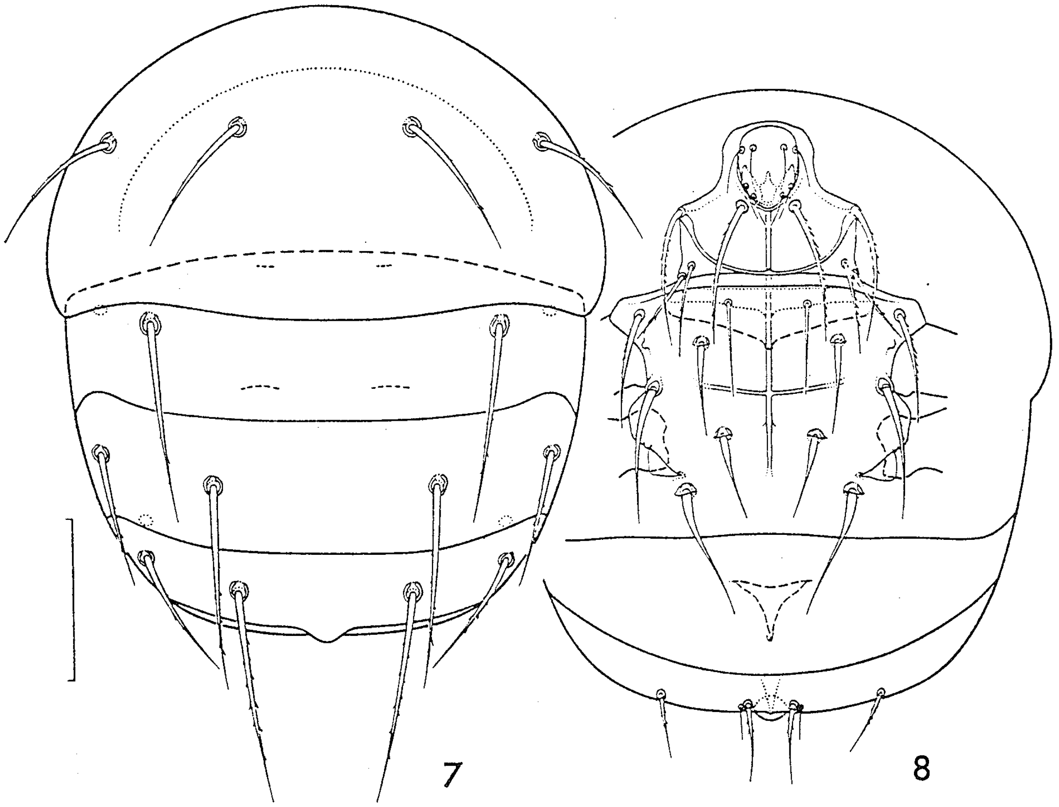
Archidispus jezoensis sp. nov.

(Figs. 7–9)

Female. Length of body (length of idiosoma), 182–208 μm; width of body (width of first hysterosomal tergite), 159–182 μm; mutual distance of anterior coxal condyles of leg III, 72–81 μm (mean 77.15 μm, N=4).

Closely allied to *A. subintermissus* sp. nov., agreeing with the description of the latter except for the features given below.

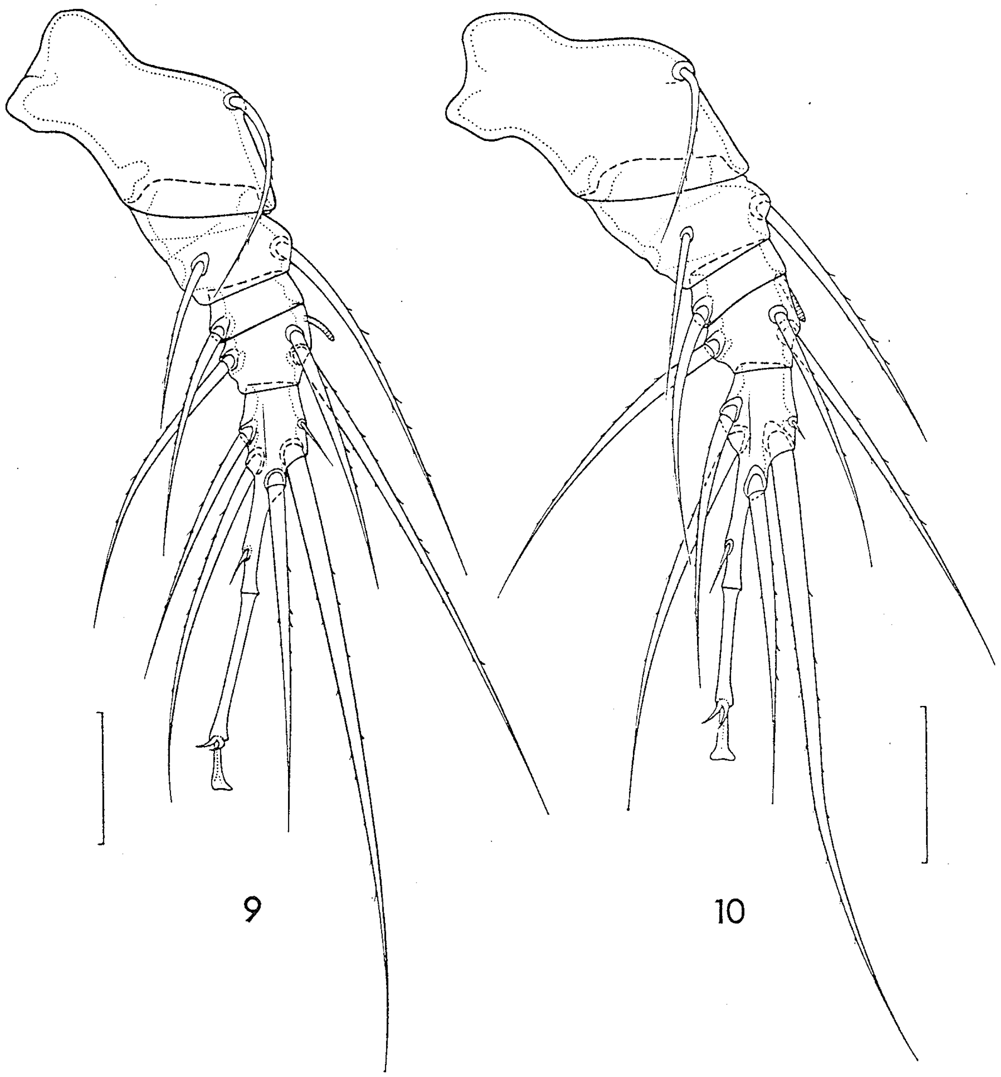
Dorsum. Setae f and h_1 moderately apart from the lateral margin of each tergite, subequal in length; ratio of distance $d–d/h_2–h_2$ 0.92, 0.97, 0.99, 1.00; $f–f/e–e$



Figs. 7–8. *Archidispus jezoensis* sp. nov., female. —— 7. Dorsum. 8. Venter. Scale: 50 μm.

0.47, 0.47, 0.49, 0.51; h_1–h_1/h_2–h_2 0.45, 0.45, 0.47, 0.48. The order in length of dorsal setae of hysterosoma: $h_1 \doteqdot f \geqq d > c_1 \geqq c_2 \doteqdot e \doteqdot h_2$.

Venter. Apodeme II somewhat variable in shape, its median portion rather evenly curved in one specimen, nearly straight in another specimen, and obliterated in two others. Secondary transverse apodeme slightly postcurved or nearly straight, touching apodeme II medially. Apodeme IV extending about a half way to ventral margins of coxal foramina III. Coxal setae: *3b* less spaced than *2a* (ratio of distance *3b*–*3b*/*2a*–*2a* 0.89, 0.89, 0.97, 0.99); *3b*, *4a* and *4b* glabrous; *3b* distinctly thickened and nearly straight in proximal 2/5 or thereabouts, and then rather gradually tapering towards fine tip; *4a* distinctly (a little more strongly than *3b*) thickened and nearly straight in proximal 1/3 or thereabouts, but fine distally, the



Figs. 9–10. Leg IV of *Archidispus* spp., female; ventral view. —— 9. *A. jezoensis* sp. nov. —— 10. *A. satoui* sp. nov. Scales: 20 μm.

transition from thick to thin portions being not abrupt; in one specimen *3b* closely resembling *4a* in shape though slightly thinner and longer; *4b* and *4c* shaped as in *A. subintermissus*.

Legs. Leg IV (Fig. 9): pretarsus about 2/3 as long as tarsus; seta *c* fairly long, but shorter than tarsus and pretarsus combined; *l* about 1.4–2 times as long as *k*; *p* longer than *l*; *q* at some distance from *p*.

Bionomics. The specimens examined (four in number), all females, were found attached to the cervical membrane between head and prothorax of adult ground beetles, *Pterostichus* (*Adelosia*) *thunbergii* MORAWITZ (tribe Pterostichini) and *Trichotichnus* (*Trichotichnus*) *longitarsis* MORAWITZ (tribe Harpalini) collected at Horoka and Furano in Hokkaido. Two Horoka specimens were found together with 14 specimens of *Archidispus curtonoti* (KUROSA) on a single individual of *P. thunbergii*, and one of the two Furano specimens was discovered in coexistence with 16 examples of *A. subintermissus* sp. nov., from a single individual of *T. longitarsis*. Nothing is known of the male and immature stages.

Type-series. Holotype: ♀, Horoka, Taisetsu National Park, Hokkaido, 11–VIII–1968, H. KAWAI, ex *P. thunbergii*. Paratypes: 1 ♀, same data as the holotype; 2 ♀, Tokyo University Forest in Furano, Hokkaido, 19–IX–1967, K. SUGIYAMA, ex. *T. longitarsis*.

Distribution. Japan (Hokkaido).

The specific name of the new species is derived from "Jezo", the old name of Hokkaido.

Archidispus satoui sp. nov.

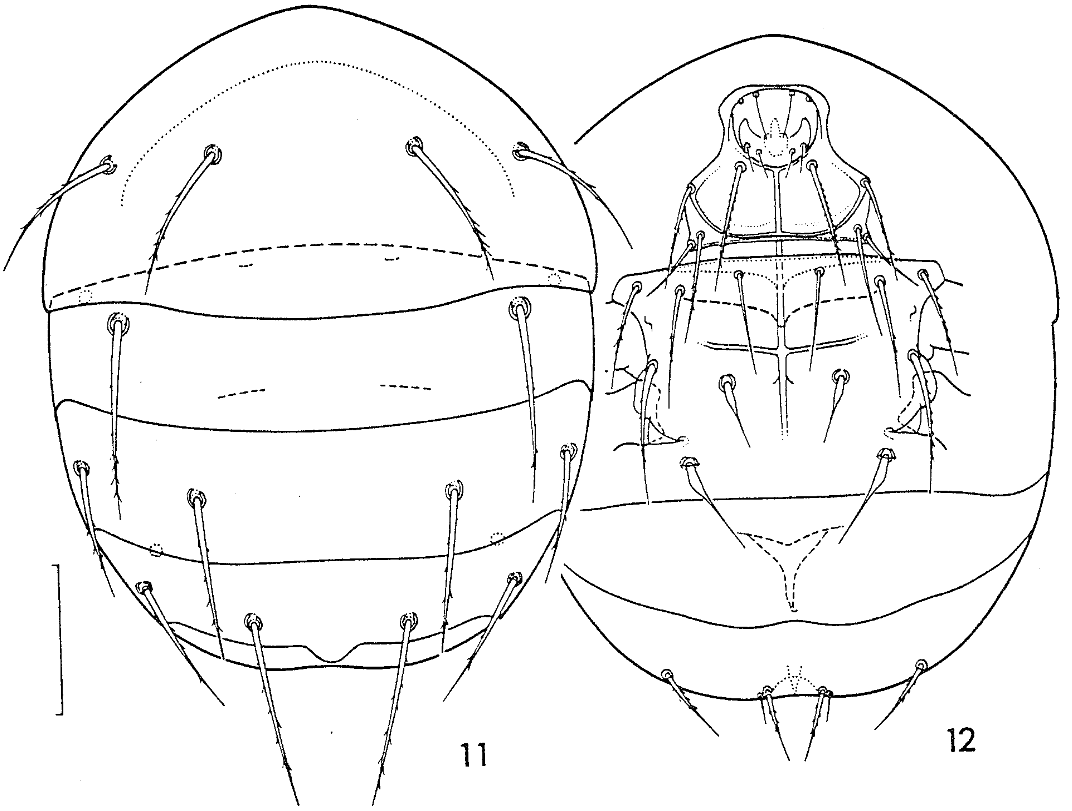
(Figs. 10–12)

Female. Length of body (length of idiosoma), 157–179 μm; width of body (width of first hysterosomal tergite), 134–154 μm; mutual distance of anterior coxal condyles of leg III, 67–73 μm (mean 70.25 ±S.D. 1.58 μm, N=40).

Related to the two preceding species, but distinguished at first sight from them by having a sclerotized clear-cut arch along the anterior margin of apodeme II.

Dorsum. Free margin of first hysterosomal tergite with rather distinct radial striations; in some specimens, free margin of the same tergite somewhat angulate anteromedially. Dorsal setae of hysterosoma moderate in thickness, with sparse barbations; c_1 and c_2 situated nearly on the same level, fairly long; c_1 extending near to the posterior margin of the tergite; *d* fairly close to the lateral margin of the tergite; *f* and h_1 well apart from lateral margin of each tergite; ratio of distance d–d/h_2–h_2 1.01–1.13; f–f/e–e 0.51–0.57; h_1–h_1/h_2–h_2 0.37–0.44. The order in length of dorsal setae of hysterosoma: $d \geqq h_1 \geqq f \geqq c_1 \fallingdotseq c_2 \geqq h_2 \geqq e$.

Venter. Gnathosoma broad for its length. Apodeme II evenly arcuate in median 2/5, sometimes making a very shallow re-entrant angle medially; along the anterior margin of apodeme II, a broad, weakly sclerotized, clear-cut arch is



Figs. 11–12. *Archidispus satoui* sp. nov., female. —— 11. Dorsum. 12. Venter. Scale: 40 μm.

always visible. Secondary transverse apodeme weakly curved backwards, touching apodeme II or (rarely) nearly so. Apodeme IV slightly oblique (rarely almost horizontal), extending about 1/2–2/3 way to the ventral margins of coxal foramina III. Coxal setae: *1a* nearly on the level of the posteriormost point of gnathosomal foramen, not stout; *3b* a little more spaced than *2a* (ratio of distance *3b–3b*/*2a–2a* 1.22–1.32), normal in shape; *4a* distinctly thickened and slightly incurved (rarely almost straight) in proximal 2/5 or thereabouts, but fine distally, the transition from thick to thin portions being abrupt; *4b* distinctly thickened and weakly incurved in proximal 1/3–2/5, fine distally, the transition from thick to thin portions being rather abrupt; *4c* not thickened basally. Caudal setae ps_1 and ps_3 subequal in length; ps_2 much shorter than ps_1.

Legs. Legs II and III: anterior and posterior claws not very different in size. Leg IV (Fig. 10): proximal portion of tarsus rather short and wide; pretarsus nearly 1/2 as long as tarsus; seta *c* extending slightly beyond the insertion for *p*, with somewhat blunt tip; *l* much longer than *k*, but less than 2/3 as long as *p*; *q* minute, rather close to *p*.

Bionomics. The specimens examined (42 females in total) were collected from adults of the ground beetles, *Stenolophus* (*Stenolophus*) *iridicolor* REDTENBACHER and *S.* (*Astenolophus*) *fulvicornis* BATES belonging to the tribe Harpalini. The female mites were found clinging to the cervical membrane between head and prothorax of host insects, with the exception of one specimen from the membrane between pro- and mesothorax of *S. iridicolor*. The largest number of mites per host was 26 (on *S. fulvicornis*). Nothing is known of the male and immature stages.

Type-series. Holotype: ♀, Matsushima-chô, Takamatsu, Kagawa Pref., 7–VII–1974, N. SATOU, ex *S. iridicolor*. Paratypes: 10 ♀, same data as the holotype; 2 ♀, Ishite, Matsuyama, Ehime Pref., 25–X–1972, K. KUROSA, ex *S. fulvicornis*; 25 ♀, Motoyama-chô, Higashi-Nada-ku, Kobe, Hyôgo Pref., 21–II–1938, K. KUROSA, ex. *S. fulvicornis*; 1 ♀, Mt. Hiei-zan, Kyoto Pref., 17–V–1980, Y. KUROSA, ex *S. fulvicornis*.

Distribution. Japan (Honshu, Shikoku).

This species is dedicated to Mr. Masaaki SATOU of Takamatsu City, who provided me with a number of ground beetles including a specimen infested with the mite.

Archidispus okumurai sp. nov.

(Figs. 13–15)

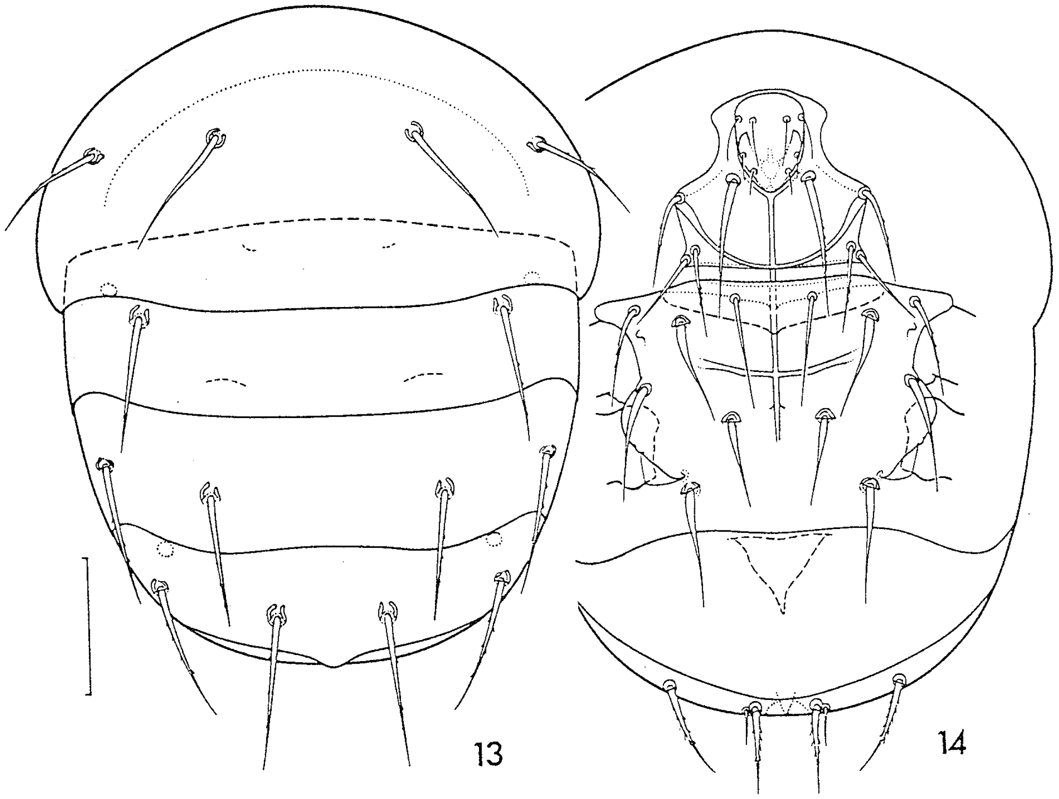
Archidispus sp. No. 25: KUROSA, 1977, 398, fig. VIII–B.

Female. Length of body (length of idiosoma), 115–151 μm; width of body (width of first hysterosomal tergite), 106–123 μm; mutual distance of anterior coxal condyles of leg III, 55–62 μm (mean 58.85 μm, N=14).

Resembling the three preceding species, but distinguished from them mainly by the smaller body size, the hysterosomal dorsal setae of subequal length, and the obviously thickened caudal setae ps_1 and ps_3.

Dorsum. Free margin of first hysterosomal tergite with rather distinct radial striations; posterolateral corner of the same tergite angulate. Dorsal setae of hysterosoma rather thin, with very weak barbations; they are not very different in length, but usually h_1 is the longest, c_2 the shortest; c_1 slightly anterior to c_2; d fairly close to the lateral margin of the tergite; h_1 rather close to median line; ratio of distance $d\text{–}d/h_2\text{–}h_2$ 1.07–1.22; $f\text{–}f/e\text{–}e$ 0.51–0.67 (usually less than 0.58); $h_1\text{–}h_1/h_2\text{–}h_2$ 0.30–0.34.

Venter. Apodeme II evenly arcuate in median 2/5, rarely somewhat angulate medially. Secondary transverse apodeme slightly procurved or nearly straight, joining apodeme II medially. Apodeme IV somewhat oblique (sometimes nearly horizontal), extending about 1/2–3/5 way to the ventral margins of coxal foramina III. Coxal setae: *1a* situated slightly anterior to the posteriormost point of gnathosomal foramen, comparatively stout; *3b*, *4a* and *4b* glabrous; *3b* slightly more spaced than *2a* (ratio of distance *3b–3b*/*2a–2a* 1.16–1.24), not so close to *3c*, conspicuously thickened and distinctly incurved in proximal 2/5 or thereabouts, and

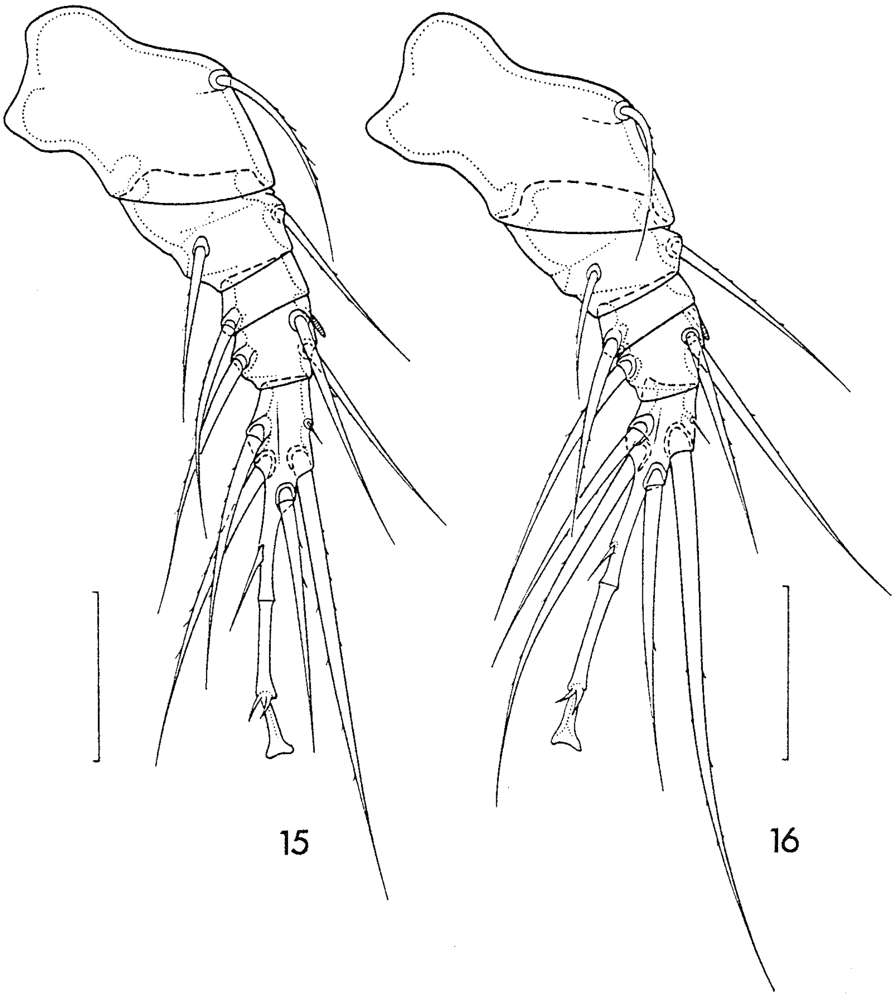


Figs. 13–14. *Archidispus okumurai* sp. nov., female. —— 13. Dorsum. 14. Venter. Scale: 30 μm.

then rather rapidly attenuated towards fine tip; *4a* distinctly thickened and nearly straight in proximal 2/5 or thereabouts, but fine distally, the transition from thick to thin portions being not abrupt; *4b* conspicuously thickened and slightly incurved at the proximal portion, gradually tapering towards fine tip; *4c* resembling *4b* in shape and size, but usually a little more strongly incurved at the proximal portion. Caudal setae ps_1 and ps_3 thickened; ps_1 a little shorter than ps_3, weakly curved laterad; ps_2 short, less than 1/2 the length of ps_1.

Legs. Legs II and III: anterior and posterior claws subequal in size. Leg IV (Fig. 15): proximal portion of tarsus not elongate; pretarsus about 2/5–1/2 as long as tarsus; setae *c* and *l* with fine apex as other long setae; *c* not attaining to the insertion for *p*; *k* and *l* situated on very different levels; *l* slightly shorter than, or as long as *k*; *p* about twice the length of *l*, or a little longer; *q* at some distance from *p*, minute.

Bionomics. The specimens examined, 14 in number, are all adult females. Four of them were found in coexistence with seven specimens of *Archidispus rostratus* KUROSA, on the cervical membrane between head and prothorax of an individual of *Anoplogenius cyanescens* (HOPE). The remaining 11 specimens were discovered from the intersegmental membrane between pro- and mesothorax (ten specimens)



Figs. 15–16. Leg IV of *Archidispus* spp., female; ventral view. —— 15. *A. okumurai* sp. nov. —— 16. *A. difficilis* sp. nov. Scales: 20 μm.

or that between head and prothorax (one specimen) of five individuals of *Acupalpus* (*Palcuapus*) *inornatus* BATES. Both the host beetles belong to the subtribe Stenolophina of the tribe Harpalini (Carabidae). Nothing is known of the male and immature stages.

Type-series. Holotype: ♀, Kita-Kogane, Matsudo-shi, Chiba Pref., 1–XII–1968, T. OKUMURA, ex *A. cyanescens.* Paratypes: 3 ♀, same data as the holotype; 7 ♀, Lake Ogura-ike, Uji-shi, Kyoto Pref., 19–III–1940, Y. YANO, ex *A. inornatus*; 2 ♀, Ibaraki-shi, Osaka Pref., 3–III–1940, Y. YANO, ex *A. inornatus.*

Distribution. Japan (Honshu).

This new species is dedicated to Mr. Takashi OKUMURA of Yokohama City, who kindly offered a great number of insect specimens for my study.

Archidispus difficilis sp. nov.

(Figs. 16–18)

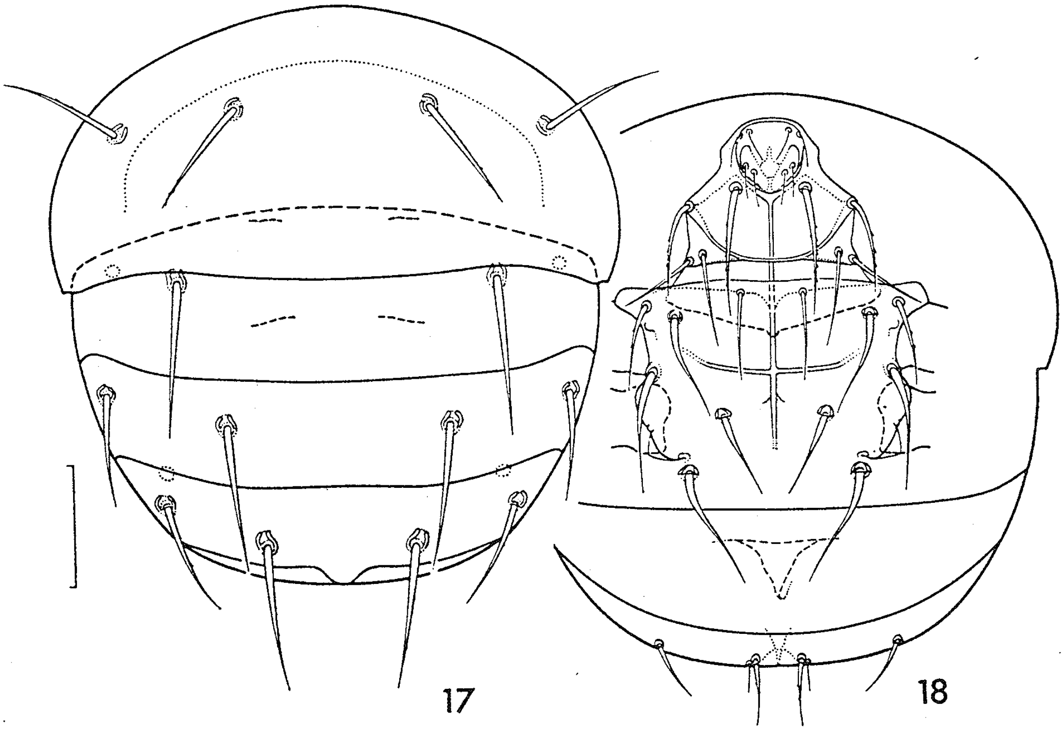
Archidispus sp. No. 26: KUROSA, 1977, 398, fig. VIII–C.

Female. Length of body (length of idiosoma), 142 μm; width of body (width of first hysterosomal tergite), 140 μm; mutual distance of anterior coxal condyles of leg III, 62 μm.

Allied to the four preceding species, in particular to *A. okumurai* sp. nov., but distinguished from *okumurai* by the position and relative length of hysterosomal dorsal setae, the position of coxal seta *3b*, the conformation of caudal setae ps_1 and ps_3, and so on.

Dorsum. Free margin of first hysterosomal tergite with distinct radial striations; posterolateral corner of the same tergite angulate. Dorsal setae of hysterosoma somewhat thicker than in *A. okumurai*; c_1 slightly anterior to, and nearly as long as c_2; d, f and h_1 moderately apart from the lateral margin of each tergite, subequal in length, distinctly longer than e and h_2; ratio of distance $d{-}d/h_2{-}h_2$ 0.92, $f{-}f/e{-}e$ 0.48; $h_1{-}h_1/h_2{-}h_2$ 0.43. The order in length of dorsal setae of hysterosoma: $d>f\doteqdot h_1>c_1\doteqdot c_2>h_2\doteqdot e$.

Venter. Apodeme II evenly arcuate in median 2/5. Secondary transverse



Figs. 17–18. *Archidispus difficilis* sp. nov., female.—17. Dorsum. 18. Venter. Scale: 30 μm.

apodeme slightly curved backwards, joining apodeme II medially. Apodeme IV slightly oblique, extending about 2/3 way to the ventral margins of coxal foramina III. Coxal setae: *1a* situated on the level of the posteriormost point of gnathosomal foramen, not stout; *3b*, *4a* and *4b* glabrous; *3b* much more spaced than *2a*, fairly close to *3c* (ratio of distance *3b–3b*/*2a–2a* about 1.4), distinctly thickened and obviously incurved at the proximal portion, gradually tapering towards fine tip; *4a* distinctly thickened and nearly straight in proximal 2/5, and then rather gradually tapering towards fine apex; *4b* similar to *3b* in shape though slightly thicker and longer; *4c* also similar to *3b*, but slightly thicker. Caudal setae short and fine; ps_1 and ps_3 subequal in length; ps_2 nearly 1/2 as long as ps_1.

Legs. Legs II and III: anterior and posterior claws subequal in size. Leg IV (Fig. 16): proximal portion of tarsus fairly short and wide, distinctly shorter than in *A. okumurai*; pretarsus about 1/2 as long as tarsus; setae *c* and *l* with fine apex as other long setae; *c* attaining to the insertion for *p*; *k* and *l* situated on slightly different levels; *l* much longer than *k*; *p* about twice the length of *l*; *q* rather close to *p*, minute; *t* shorter than in *A. okumurai.*

Bionomics. The single specimen examined is an adult female. It was found attached to the cervical membrane between head and prothorax of an adult of the ground beetle, *Stenolophus* (*Egadroma*) *difficilis* (HOPE) belonging to the tribe Harpalini. Nothing is known of the male and immature stages.

Type-specimen. Holotype: ♀, Riv. Tonegawa by Toride-shi, Ibaraki Pref., 17–IX–1972, K. KUROSA, ex *S. difficilis*.

Distribution. Japan (Honshu).

RELATIONSHIP OF THE GROUP OF *Archidispus intermissus*

Archidispus intermissus (KARAFIAT, 1959) from Europe and the five Japanese species described above are closely related to one another, and seem to constitute a species-group having the following characteristics in common.

Female. Free margin of first hysterosomal tergite with radial striations more or less distinct. Dorsal setae of hysterosoma simple, moderate in thickness or rather slender, with weak barbations; c_1 situated on the level of c_2, or slightly anterior to the latter; marginal thickening of insertion pore for c_2 without mesal or posteromesal protrusion; *d* comparatively close to the lateral margin of the tergite. Secondary transverse apodeme well developed, weakly curved or nearly straight, crossing anterior sternal apodeme at a point rather close to apodeme II or completely meeting apodeme II. Apodeme IV more or less oblique, not extending to the ventral margins of coxal foramina III. Coxal setae: *1a* situated roughly on the level of the posteriormost point of gnathosomal foramen, close to apodeme I; *2a* anteromesad of *2b*; *3b* somewhat posterior to *3a*; *4a* situated closer to apodeme IV than to the level of *4b*; *4a*, *4b* and frequently also *3b* distinctly thickened at the proximal portion, glabrous. Caudal setae short. Tibiotarsus of leg I stout. Proximal portion of tarsus IV not elongate; distal portion of tarsus, and pretarsus moderately elongate; tarsus including pretarsus shorter than the remaining segments combined; seta *q* situated not so apart from insertion for *p*, small to minute.

In view of the shape of tarsus IV, this group seems to be rather primitive in the genus *Archidispus*.

These six species can be distinguished by the following key:

1. Coxal seta *3b* barely or not thickened at the proximal portion...............2

— Coxal seta *3b* distinctly thickened at the proximal portion.................4

2. Hysterosomal dorsal setae *f* and h_1 well apart from lateral margin of each tergite (ratio of distance *f*–*f*/*e*–*e* less than 0.60; h_1–h_1/h_2–h_2 less than 0.50); a weakly sclerotized, clear-cut arch is visible along the anterior margin of apodeme II; setae *l* and *p* on leg IV much different in length. ....*A. satoui* sp. nov.

— Hysterosomal dorsal setae *f* and h_1 fairly close to lateral margin of each tergite; no such a sclerotized arch as described above; setae *l* and *p* on leg IV subequal in length. 3

3. Ratio of distance *f*–*f*/*e*–*e* about 0.83; h_1–h_1/h_2–h_2 about 0.74 (calculated from the text-figure in the original description). ....*A. intermissus* (KARAFIAT, 1959)

— Ratio of distance *f*–*f*/*e*–*e* 0.65–0.72; h_1–h_1/h_2–h_2 0.53–0.62...*A. subintermissus* sp. nov.

4. Larger species (mutual distance of anterior coxal condyles of leg III about 72–81 µm); coxal seta *3b* less spaced than *2a*. ....*A. jezoensis* sp. nov.

— Smaller species (mutual distance of anterior coxal condyles of leg III less than 65 µm); coxal seta *3b* more spaced than *2a*. 5

5. Hysterosomal dorsal setae not very different in length; ratio of distance *3b*–*3b*/*2a*–*2a* 1.16–1.24; caudal setae ps_1 and ps_3 distinctly thickened; setae *k* and *l* of tibia IV situated on very different levels; *l* slightly longer than, or as long as *k*. ....*A. okumurai* sp. nov.

— Hysterosomal dorsal setae *f* and h_1 distinctly longer than *e* and h_2; ratio of distance *3b*–*3b*/*2a*–*2a* about 1.4; caudal setae ps_1 and ps_3 fine; setae *k* and *l* of tibia IV situated on slightly different levels; *l* much longer than *k*. ....*A. difficilis* sp. nov.

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